

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-160  
Relating to Exemptions under Section 27156  
of the Vehicle Code

ADVANCED EMISSION TECHNOLOGY

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Universal Fuel Fill Pipe Restrictor manufactured by Advanced Emission Technology has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for repairing damaged or missing fuel fill pipe restrictors on vehicles certified for unleaded gasoline only.

Sales of this device must be limited to qualified repair facilities only. Retail sales of this device must include proper installation. Advanced Emission Technology must notify all establishments purchasing this device of this restriction.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE UNIVERSAL FUEL FILL PIPE RESTRICTOR MANUFACTURED BY ADVANCED EMISSION TECHNOLOGY.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.


Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 27<sup>th</sup> day of December, 1985.

  
K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF ADVANCED EMISSION TECHNOLOGY'S UNIVERSAL FUEL FILL PIPE  
RESTRICTOR FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156  
IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE  
CODE

December, 1985

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AIR RESOURCES BOARD

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CODE

by

Mobile Source Division  
State of California  
Air Resources Board  
9528 Telstar Avenue  
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(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

## SUMMARY

Advanced Emission Technology of Vancouver, Washington, has applied for exemption from the California Vehicle Code (V.C.) Section 27156 for the universal fuel fill pipe restrictor to be used for repairing damaged fuel fill pipe restrictors on California certified vehicles designed to operate using unleaded gasoline. V.C. Section 27156 prohibits modifications to automobile emission control systems unless it is demonstrated that the effectiveness of the control system is not reduced.

The applicant submitted two samples of the device which were installed into sample fill pipes with a damaged restrictor and three samples of the device not installed to aid in the evaluation. Advertising material and installation instructions were also submitted.

The staff evaluated the device in accordance with the requirements of the "Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks", (Specifications), as incorporated by reference in Section 2290 of Title 13, California Administrative Code. The evaluation of the device did not detect any functional discrepancies between the device and the Specifications.

The staff recommends that the Advanced Emission Technology's universal fuel fill pipe restrictor be exempted from the prohibitions of Vehicle Code Section 27156 and Executive Order D-160 be issued.

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EVALUATION OF ADVANCED EMISSION TECHNOLOGY'S UNIVERSAL FUEL FILL PIPE RESTRICTOR  
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE  
WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE

I. INTRODUCTION

Advanced Emission Technology (AET) of Vancouver, Washington, has applied for exemption from the California Vehicle Code Section 27156 for the universal fuel fill pipe restrictor which is designed to repair the damaged or missing original equipment manufacturers' (OEM) fuel tank fill pipe restrictor. Section 27156 prohibits tampering of the vehicle's emission control systems by the installation of add-on devices or vehicle modifications. Exemptions to the Section's prohibitions are granted provided that it is determined that the device does not reduce the effectiveness of the vehicles emission control systems.

The applicant submitted a total of five samples for inspection and evaluation. The applicant also submitted for the evaluation advertising material and installation instructions.

The instructions state that the restrictor is designed to be installed by qualified mechanics, muffler shops or radiator shops, etc. This is the intention of the applicant, as they will only sell to these types of establishments and have a minimum order of 5 units.

II. CONCLUSION

Evaluation of the design and installation of the universal fuel fill pipe restrictor was made in accordance to the requirements of the Specifications. Based on its evaluation, the staff concludes that the device meets the Vehicle Code Section 27156 exemption requirements.

### III. RECOMMENDATION

The staff recommends that Advanced Emission Technology's universal fuel fill pipe restrictor be exempted from the prohibitions of V.C. Section 27156 and that Executive Order D-160 be issued.

### IV. DEVICE DESCRIPTION

Advanced Emission Technology's universal fuel fill pipe restrictor is designed to replace a damaged or tampered OEM restrictor in the existing fuel tank fill pipe. It consists of a stamped piece of 16 gauge steel in the shape of a large washer with three tabs on it's outside diameter. It has a center hole with a diameter of 0.906 inches held to a tolerance of plus or minus 0.005 inches. A flapper door made of spring steel is rivited to the restrictor under the hole and maintained in the closed position unless forced open by a fuel filling nozzle (see attachment 1). The restrictor is stamped with the required identification information (see attachment 2).

To install the restrictor, the fuel fill pipe must be removed from the vehicle. On some vehicles the entire fuel tank must be removed. Once this is done, proper preparation of the fuel fill pipe/fuel tank for soldering or brazing must be performed to prevent explosions or fire. Next, the old restrictor must be removed or bent out of the way to allow free movement of the flapper door. The tabs are then bent to match the diameter of the fill pipe and the restrictor is positioned as close as practical to the location of the OEM restrictor. On vehicles with removeable fill pipes, the tabs on the restrictor are bent to the proper diameter of the fill pipe and inserted from the tank end of the fill pipe to the proper position. Once in place the tabs of the restrictor can be soldered to the wall of the fill pipe. On vehicles



which have the fill pipe face soldered to the fill pipe, the fill pipe face is heated and removed to allow the installation of the restrictor with the tabs pre-bent to the proper diameter. The tabs are then soldered to the fill pipe wall.

The ability to pre-bend the tabs of the restrictor to the proper diameter is necessary to provide adequate contact between the tabs and the fill pipe wall to assure a strong solder bond. On some vehicles it is not possible to insert the restrictor pre-bent to the proper diameter. In these cases the restrictor must be bent so that it can fit through the fill pipe face and then rebent while inside the fill pipe. This operation is difficult and in most cases it is not possible to obtain adequate contact between the tabs and the fill pipe wall to assure a strong solder bond. The applicants instructions recommend brazing, silver soldering or spot welding when this situation arises. The tabs of the restrictor are pre-tinned to make the soldering operation easier. If brazing or some other method is used to attach the restrictor, this solder must be removed prior to installation.

The mechanic performing the installation must determine what method of attachment should be used after examining the fill pipe of the vehicle for each installation. Because of this, the restrictor must be installed by qualified mechanics capable of making such a determination. For this reason the applicant chooses to only sell to qualified establishments and not over the counter to the general public. They have a minimum order of five units to discourage individuals from ordering the device.

#### V. DEVICE EVALUATION

The device was evaluated based on the following criteria:

- 1) Ability to restrict leaded fuel nozzles

- 2) Specifications for fill pipes and openings of motor vehicle fuel tanks
- 3) Durability
- 4) Installation procedures

The minimum outside diameter of a leaded fuel nozzle is 0.930 inches. The restrictor has a inside diameter of 0.906 inches which is significantly smaller than the smallest leaded fuel nozzle. The unleaded test nozzle spout fits into the restrictor easily and the leaded fuel test nozzles do not. The staff has determined that the restrictor will perform adequately in preventing the insertion of a leaded fuel nozzle.

According to the Specifications for fill pipes and openings of motor vehicle fuel tanks, "angle alpha" and "angle beta" are the angles between the axial centerline of the fill pipe face and the axial centerline of the test nozzle spout when in its normal resting position and unlatched position, respectively. The angle alpha should range between - 10° and 20° for 1979 and older model-year vehicles and no less than 30° for 1980 and newer model-year vehicles. The angle beta should be at a certain angle so that the penetration of the test fuel nozzle in the fill pipe is at least 2.25 centimeters. These angles will be changed and may be out of the specifications because the restrictor locates the filling hole near the centerline of the fill pipe and some OEM restrictor filling holes are located eccentric with respect to the fill pipe centerline. For this reason tests were conducted to determine the effect of relocating the filling hole. The results of tests conducted on four typical fill pipes showed that the unleaded nozzle latches in position as described in the specifications and the vapor recovery boot makes a good seal

against the fill pipe face with the filling hole relocated. The staff has determined that the use of the restrictor will not reduce the effectiveness of filling station vapor recovery systems.

The restrictor does not completely cover the cross-sectional area of the fuel fill pipe; there are openings between the outside contour of the device and the inside wall of the fill pipe. The staff conducted an experiment to find out if fuel could pass through these openings by feathering the nozzle to allow small quantities of fuel to flow into the tank. The experiment determined that very little fuel can pass through the openings. Most of the fuel coming out of the fuel nozzle splashed out of the fill pipe even though the trigger of the fuel nozzle was in a minimum flow position. The staff is of the opinion that it would be difficult to misfuel with the restrictor installed in the fill pipe.

The flapper door on the restrictor is constructed of spring steel and during the course of testing proved to be adequate. The only problem with it was on a restrictor which was brazed into place. Apparently the high temperature required to braze, weakened the spring steel causing it to not shut all the way. The staff has determined that it still serves it's function of preventing leaded fuel from flowing through the restrictor easily.

A simple durability test was conducted on two of the sample restrictors installed in fill pipes. The fill pipes were clamped in a vice and a leaded nozzle was used to try and break the restrictor. Considerable effort was required to break the restrictor. The staff determined this was equal to the effort required to break an OEM restrictor.

The installation instructions are adequate for the qualified mechanic (see attachment 3). They provide guidelines for the installer, but the method of attachment and the quality of the installation are largely dependent on the

individual installer. The staff believes that mechanics experienced in gas tank repair are capable of installing this device correctly. The danger of explosion is always present when working around gas tanks with open flame torches. This is the main reason for curtailing the sales of this device.

#### VI. DISCUSSION

There is a need for a product of this type in California. Using the inspection/maintenance program test data summaries for a four month period it was determined that 3.3% of the vehicles tested had tampered fuel fill pipe restrictors. Out of 177,200 vehicles which require unleaded fuel that were tested, 5826 vehicles had been tampered. At the present time the only way to repair this kind of damage is to replace the fill pipe or on some vehicles the entire tank and fill pipe unit. This is very costly to the consumer and for certain vehicles these parts are not available. The Advanced Emission Technology universal fuel fill pipe restrictor presents itself as an economical alternative for the consumer. A telephone survey of shops that are installing this device in other states showed that the cost to the consumer is between 30 and 80 dollars depending on the work involved.

The staff is of the opinion that if this device is installed correctly it will perform the same function as an OEM restrictor.

ATTACHMENT I  
DETAILS AET FILL PIPE RESTRICTOR

**MATERIALS**

- I. Drawings A10, A20, A30, A40 (FRAME)
  - A. 16 ga CR
  - B. Tolerances  $x = \pm .005$
- II. Drawings B10, B20, B30 (DOOR)
  - A. .007 Blue Clock Spring (optional 1095 .007 annealed--hardened to 46-48 C Rockwell)
  - B. Tolerances  $x = \pm .005$
- III. Details of Rivet (not shown):
  - A. Steel
  - B. Button Head Preferred

**EXPLANATION OF DRAWINGS**

- View A10 = (Front, before forming)
- View A20 = (Front, after forming)--TS designates tin tabs with 50/50 solder
- View A30 = (Side view, after forming)
- View A40 = (Top view, after forming)
- View B10 = (Front view)
- View B20 = (Side view--radius approximately simulated in riveted position)
- View B30 = (Top view--simulated in riveted position)

# LEGEND

aa = 3.000

bb = 1.625

cc = .375

dd = .867

ee = .180

ff = 1.500

gg = .906

hh = .180

ii = .480

jj = 2.312

kk = 3.000

ll = .180

mm = .480

nn = .125 (hole)

oo = .180

pp = .420

qq = 1.875

rr = .625

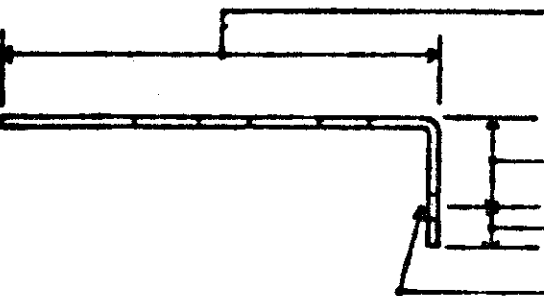
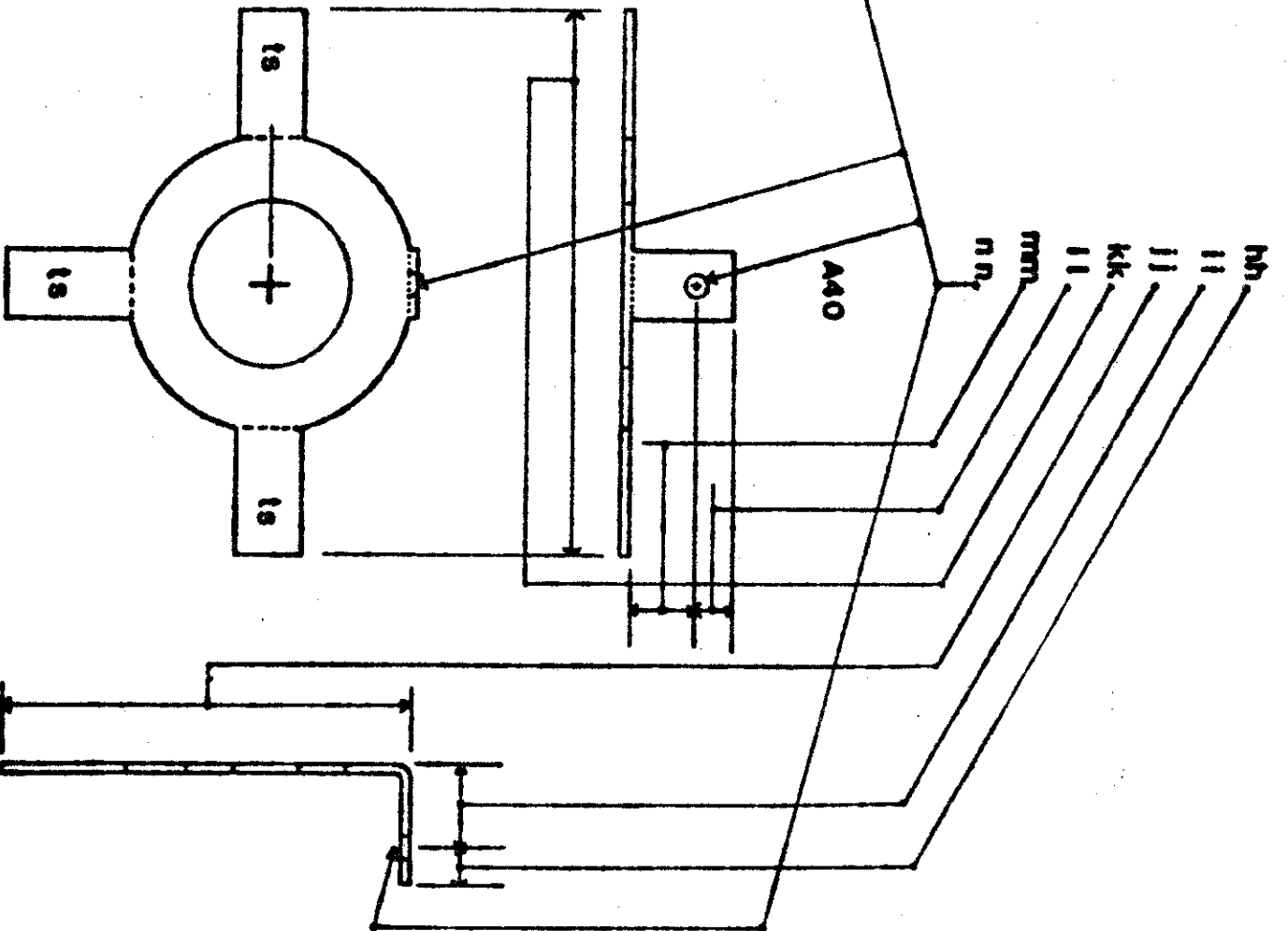
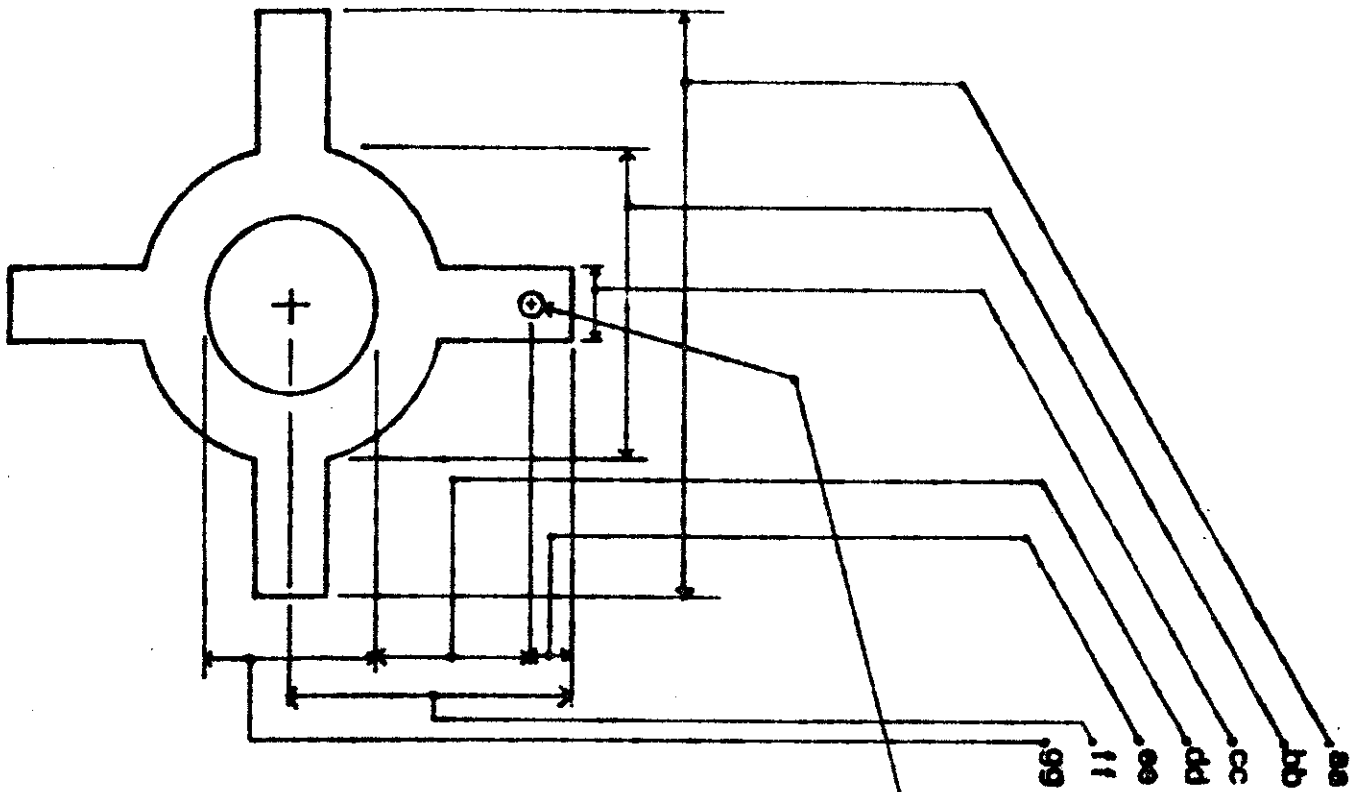
ss = .570

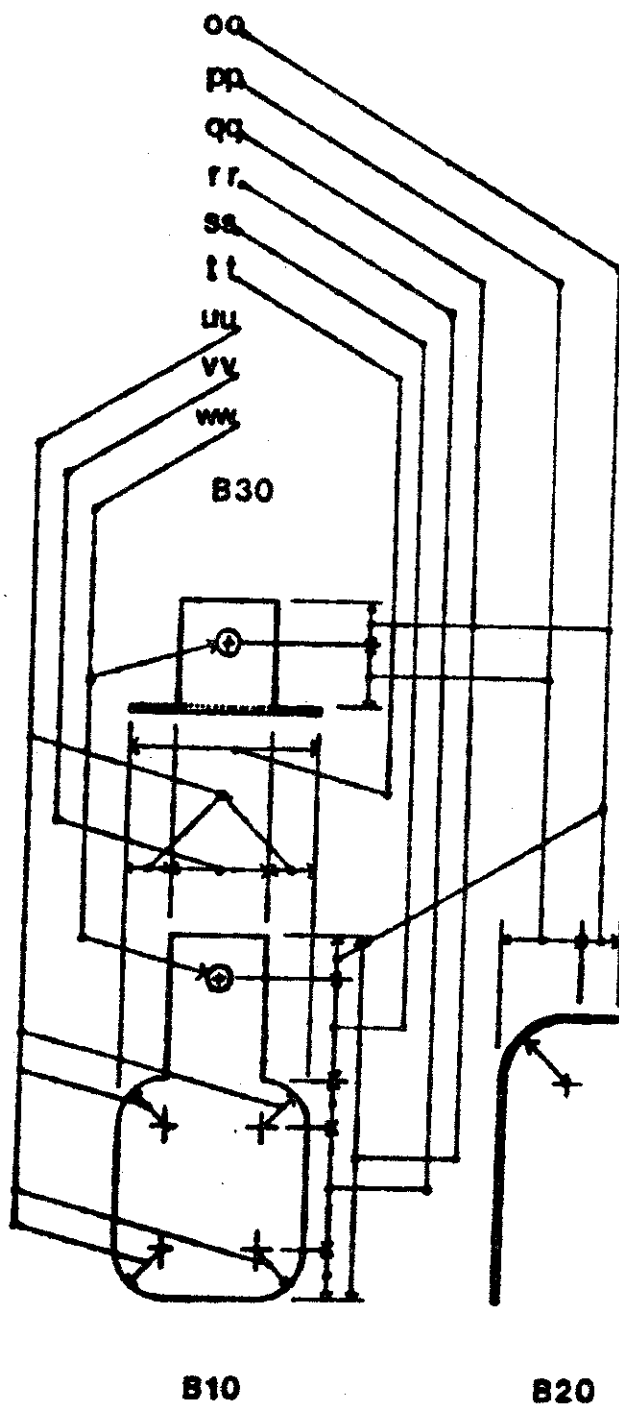
tt = 1.000

uu = .250

vv = .500

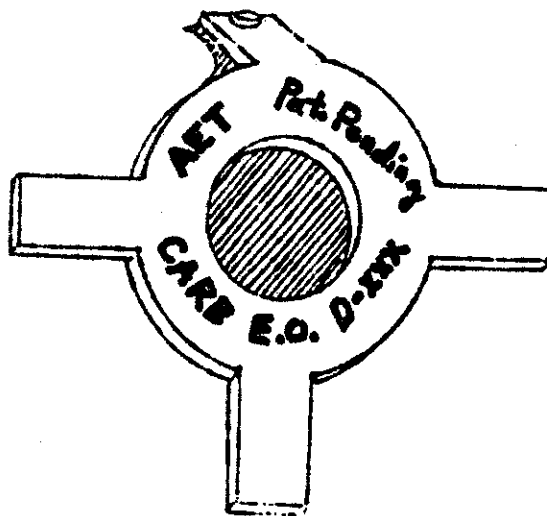
ww = .125 (hole)







ATTACHMENT 2





## Advanced emission tech.

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All restrictors should be placed in filler neck and checked to make sure restrictor tabs fit flush against neck prior to attachment. (pg. 2 - #4)

In some cases especially GM and other models with screw in cap, it may be easier to heat entire flange and remove it for insertion of restrictor.

If normal soldering methods do not appear adequate for permanent attachment then brazing silver solder, or spot welding may be used.

This can be determined by the qualified person doing installation.

Extreme care should be taken not to overheat filler neck or restrictor.

PROPER SAFETY PRECAUTIONS SHOULD ALWAYS BE FOLLOWED  
WHEN WORKING AROUND GAS TANKS OR FUEL NECKS.



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### Helpful Hints for Installation

1. Remove filler neck from vehicle.
2. Remove as much as necessary of tampered restrictor to allow for door clearance.
3. With screwdriver test door to assure proper operation.
4. Bend 3 pretinned tabs forward towards cap and insert replacement restrictor as close as practical to original location.
5. Using a small C-clamp anchor tab in place.
6. Use a screwdriver or other flat tool to hold one of the remaining tabs against the side of neck. Heat neck from outside till solder begins to run, allow to cool, and if secure repeat process on remaining tabs. (It may be necessary to add more solder to tabs.)
7. Replace filler neck in vehicle.

Proper safety precautions should always be followed when working around gas tanks or fuel necks.

This restrictor is designed to be installed by qualified mechanic, muffler or radiator shop etc.